Checklist of Marine Mollusks at Coyote Point Park, San Francisco Bay, California

BY

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(1 Text figure)

INTRODUCTION

Coyote Point is located in the city of San Mateo on the western shore of San Francisco Bay, California. Within its boundaries are 4 marine habitats: salt marsh, pilings and floating docks, rocky rubble and boulders, and sandy beach (Figure 1). The harbor on the east side of the point has been created by extensive dredging and filling.

Although the park offers one of the southernmost extensive rocky intertidal habitats in San Francisco Bay, it has been studied poorly. Packard (1918) mentioned species taken in oyster beds near Point San Mateo. Records of introduced species at the park are given by Stohler (1962), Hanna (1966), Carlton (1969), and Wicksten (1976). There are no quantitative data for any of the marine mollusks despite their abundance, importance in the local food chain, and use in a sport fishery.

From 1970 to 1977, I maintained a list of marine mollusks at the park. Notes on their natural history and seasonal occurrence also were kept. This paper presents this information in hopes that it will stimulate research in this unusual protected area and assist workers in determining the distribution of mollusks in San Francisco Bay.

METHODS

During 1970 to 1977, collecting trips were made at least once in each season of the year. All areas were sampled from the highest tidal zone to the −2.0 foot [−0.6m] tide level except at the mud flats, where extreme softness of the mud prevented exploration below the +1.0 foot [0.3m] tide level. Animals also were collected by means of SCUBA diving and snorkeling off Peninsula Beach and in the harbor at depths to 5m. The dredge tailings near the harbor were examined for empty shells. Specimens of all species are available for inspection in the collections of the Coyote Point Museum or in my personal collection. Additional specimens were donated to the California Academy of Sciences in San Francisco.

The list of species is arranged in phylogenetic order. A species is termed resident (R) if it has been taken during all seasons of the year for 3 or more continuous years. Casual species (C) are natives found only once or twice during the period of study. Accidental species (AC) are introduced species found alive only once during 1970 to 1977, or which have been reported alive at the park since 1960. Those species termed offshore (O) have been found cast ashore after storms or strong waves during at least 3 consecutive years, but have not been observed by me in the intertidal zone. Except for *Tegula funebralis*, all the species known only from dead shells were obtained in the dredge tailings.

Native species (N) are those whose place of origin is the west coast of North America. I follow the report of Carlton (1975) in determining which species have been introduced from the Atlantic Ocean (A) or the area around Japan and Korea (J).

RESULTS

Of the 36 species found at Coyote Point, 20 (56%) are native, 14 (39%) have been introduced from the Atlantic Ocean, and 2 (5%) have been introduced from the western Pacific Ocean. The Atlantic species probably were brought in with eastern oysters (*Crassostrea virginica*) which were farmed near Coyote Point until about 1920 (Barrett, 1963).

The pyramidellid snail *Odostomia* sp. belongs to a group in which identification to species is difficult. Until

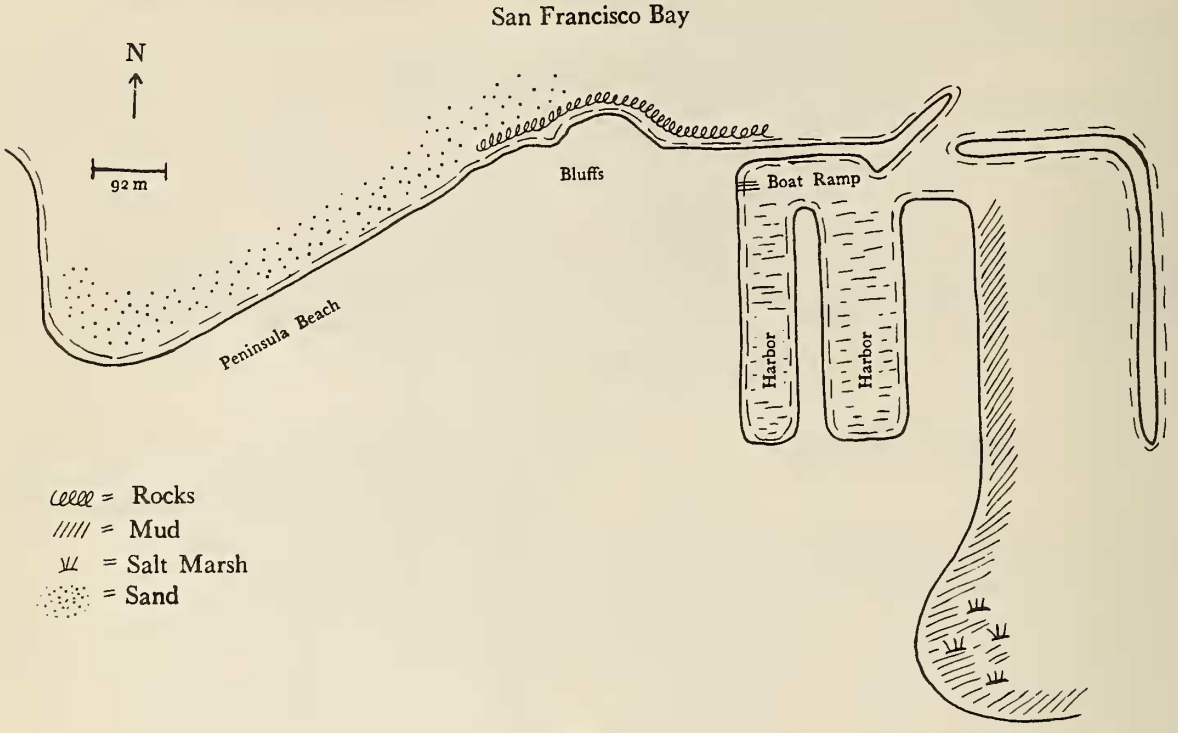

Figure 1

Map of Coyote Point

the species can be determined, its place of origin remains uncertain.

A flat slipper shell, *Crepidula perforans* (?) occurs only in apertures of large gastropod shells occupied by the hermit crab *Pagurus hirsutiusculus* Dana, 1851. Unlike *Crepidula nummaria*, this slipper shell lacks a shaggy periostracum and a deep shell. Although the Atlantic slipper shell *Crepidula plana* Say, 1822 may have been introduced into San Francisco Bay, I can detect no morphological differences between flat slipper shells from Coyote Point and shells taken from apertures of hermit crab-inhabited shells collected at Pacific Grove, off Santa Catalina Island, and along the Palos Verdes Peninsula, California. Until some means is found to distinguish *C. perforans* from *C. plana* in areas where the two might mingle, the identity of the flat slipper shell at Coyote Point remains uncertain.

Although 15 species of resident mollusks occur at Coyote Point, only 9 species were observed spawning or found as recently-settled individuals *Ilyanassa obsoleta*, *Urosalpinx cinerea*, and *Busycotypus* were observed laying egg masses during all seasons of the year. Two *Aplysia californica* produced egg masses in July, 1977. Egg-bearing *Crepidula convexa* and spawning *Mytilus edulis* were found during all seasons of the year. Very small, newly settled *Mytilus edulis*, *Tapes japonica*, and *Mya arenaria* were collected during summer months.

The turbid water of San Francisco Bay contains much plankton and detritus which can be used as food by the suspension feeders and deposit feeders at Coyote Point. Abundant growths of diatoms, *Ulva* sp., and other algae nourish the herbivores. *Urosalpinx cinerea* eats *Ostrea lurida*, and may prey on barnacles at the point. *Busycotypus canaliculatus* and *Ilyanassa obsoleta* readily will feed on dead fish.

There are few predators on mollusks at Coyote Point. No echinoderms were found during the period of study. Except for *Urosalpinx cinerea*, no carnivorous gastropod has been observed preying on other mollusks. The rock crabs, *Cancer productus* Randall, 1839 and *C. antennari-*

Table 1

Species List

Species	Residency	Origin	Notes
AMPHINEURA:			
Mopalia hindsii (Reeve, 1847)	C	N	2 animals found by bluffs, 6 April 1977.
PELECYPODA:			
Mytilus edulis Linnaeus, 1759	R	N	On rocks, docks, and pilings.
Musculus senhousia (Benson, 1842)	O	J	Probably lives on soft bottom.
Ischadium demissum (Dillwyn, 1817)	AC?	A	Edge of salt marsh, 1975 (M. Danielson, pers. comm.)
Ostrea lurida Carpenter, 1863	R	N	On rocks, docks, and pilings.
Epilucina californica (Conrad, 1837)	C	N	2 animals cast ashore, 22 April 1973.
Tapes japonica Deshayes, 1853	R	J	In sand and mud.
Mercenaria mercenaria (Linnaeus, 1758)	AC	A	Collected in 1968 (Carlton, 1969).
Gemma gemma (Totten, 1834)	R	A	In sand and mud.
Cryptomya californica (Conrad, 1837)	C	N	1 animal commensal with *Arenicola brasiliensis* Nonato, 1958; August 1973.
Mya arenaria Linnaeus, 1758	R	A	In sand and mud.
Macoma balthica Linnaeus, 1758	R	A	In mud.
Macoma nasuta (Conrad, 1837)	R	N	In mud.
Lyonsia californica Conrad, 1837	O	N	Probably lives in soft bottom.
GASTROPODA:			
Collisella digitalis (Rathke, 1833)	R	N	On boulders at high tide.
Collisella strigatella (Carpenter, 1864)	R	N	On boulders in middle intertidal zone.
Collisella pelta (Rathke, 1833)	C	N	1 animal found on boulders, 2 January 1974 and 1 found on boulder, 2 July 1977.
Littorina scutulata Gould, 1849	R	N	On rocks at high tide level.
Crepidula convexa Say, 1822	R	A	On shells and cobble, low tide level.
Crepidula nummaria Gould, 1846	C	N	1 animal found on rock at low tide, 1972.
Crepidula perforans Valenciennes, 1846(?)	R	N?	Inside shells occupied by hermit crabs.
Nucella lamellosa (Gmelin, 1792)	C	N	3 animals under ledge, 25 March 1972.
Urosalpinx cinerea Say, 1822	R	A	Among *Ostrea lurida* and on rocks.
Busycotypus canaliculatus (Linnaeus, 1758)	O	A	Rarely found intertidally on sand or mud, more common on soft subtidal bottoms.
Ilyanassa obsoleta (Say, 1822)	R	A	On mud flats and in salt marsh.
Phytia myosotis (Draparnaud, 1801)	R	A	Under drift at high tide in salt marsh.
Aplysia californica Cooper, 1863	C	N	3 large animals found near rocks by bluffs, 2 July 1977.

us Stimpson, 1856 probably eat some pelecypods. The black-tailed shrimp *Crangon nigricauda* Stimpson, 1856 eats *Gemma gemma*. The bat ray *Myliobatus californica* Gill, 1865 and the leopard shark *Triakis semifasciata* Girard, 1859 eat pelecypods inhabiting shallow sandy or muddy bottoms off the park.

DISCUSSION

Fluctuating conditions of temperature, salinity, and turbidity at Coyote Point may prevent many species of mollusks from becoming residents. Casual species which occur widely on the coast outside of San Francisco Bay may drift in as planktonic larvae or be recruited from other parts of the Bay when environmental conditions are favorable for their survival.

Of the 2 accidental species, *Mercenaria mercenaria* probably no longer occurs at Coyote Point. No live specimens have been found since 1968 (Carlton, 1969), and no living populations are known near San Mateo. *Ischadium demissum*, however, is widespread in southern San Francisco Bay and may extend its range into the salt marsh at the park.

Except for *Tegula funebralis*, all the species known only from dead shells are inhabitants of sandy or muddy bot-

Table 2

Species Known Only from Dead Shells

PELECYPODA:	
Anadara transversa (Say, 1822)	A
Argopecten irradians irradians (Lamarck, 1819)	A
Crassostrea virginica (Gmelin, 1791)	A
Clinocardium nuttalli (Conrad, 1837)	N
Tresus nuttalli (Conrad, 1837)	N
Petricola pholadiformis Lamarck, 1818	A
Barnea subtruncata (Sowerby, 1834)	N
GASTROPODA:	
Tegula funebralis (A. Adams, 1855)	N
Odostomia sp.	N?

toms. *Tegula funebralis* is abundant outside the Bay and near its mouth, which suggests that it may be a casual visitor to rocky areas at the park.

Only old, chalky valves of *Clinocardium nuttalli* and *Barnea subtruncata* were found in dredge tailings. However, entire shells of *Tresus nuttalli* were discovered buried with the gaping posterior end oriented toward the surface of the mud. Packard (1918) reported finding shells of *T. nuttalli* (as *Schizothaerus nuttalli*) and live individuals of *C. nuttalli* (as *Cardium corbis*) in southern San Francisco Bay. That these shells were found only in dredge tailings which also contain shells of *Crassostrea virginica* suggests that these native species occurred near the point in the early part of the twentieth century. It is possible that these pelecypods were killed by dredging that buried them.

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